

## **CLAIMS**

What is claimed is:

1. A process for making angled flying lead wire structures attached to an electronic circuit component comprising:

a first process step used to bond said flying lead wire to a first surface of said electronic circuit component;

a second process step where the movement of the wire capillary tool and the XY stage are controlled to form a desired shape in said flying lead wire;

a third process step where a single shear blade mechanism is positioned in contact with said flying lead wire;

a forth process step where said capillary tool is raised to tension said wire against said shear blade and sever said wire.

2. A process according to claim 1, further including forming said flying lead wires with a plurality of angles relative to the surface of said electronic circuit component.

3. A process according to claim 2, further including forming said flying lead wires with a plurality of heights relative to the surface of said electronic circuit component.

4. A process according to claim 3, further including forming said flying lead wires to have a shape selected from the group consisting of linear, piece wise linear, continuously curved, and combinations thereof.

5. A process for making flying lead wire structures attached to an electronic circuit component comprising:

bonding said flying lead wire to a first surface of said electronic circuit component;

controlling the movement of the wire capillary tool and the XY stage to form a desired shape in said flying lead wire;

shearing said flying lead wire with a double shear blade mechanism positioned on opposite sides of said flying lead wire and creating a small nick on opposite side of said wire;

said capillary tool is raised to sever said wire at the point where said nicks were formed by said shear blades, said flying lead wires having wire tip end.

6. A process according to claim 5, further including forming said flying lead wires with a plurality of angles relative to the surface of said electronic circuit component.

7. A process according to claim 6, further including forming said flying lead wires with a plurality of heights relative to the surface of said electronic circuit component.

8. A structure according to claim 1 or 5, further including maintaining said flying lead wire in a predetermined position by disposing a sheet of material having a plurality of openings therein through which said flying lead wires project .

9. A structure according to claim 8, wherein a compliant frame structure is used to support said sheet of materials .

10. A structure according to claim 8 wherein said sheet is spaced apart from said surface by an electronic component to provide flexible support.

11. A structure according to claim 8 wherein said sheet is spaced apart from said surface of the electronic component by a rigid support, said rigid support serves as a stand-off, or hard stop, to limit the degree of movement of said wire tip end in a direction perpendicular to said surface.

12. A structure according to claim 8 wherein said sheet is spaced apart from said surface of the electronic component by a support with the composite structure of both a rigid and a compliant layer.

13. A structure according to claim 10 wherein a space between said surface of the electronic component and said sheet is filled with a compliant medium.

14. A structure according to claim 13 wherein said the compliant medium is an elastomeric material.

15. A structure according to claim 13 wherein said the compliant medium is a foamed polymer material.

16. A structure according to claim 10 wherein said flexible support is selected from the group consisting of a spring and an elastomeric material.

17. A structure according to claim 8 wherein said wire tip ends comprise a structure selected from the group consisting of a protuberance, a spherical contact geometry, a straight contact end, a sharp spike, multiple sharp spike, sharp nodules and the combination of the above.

18. A structure according to claim 8 wherein said wire end tips are coated with a material selected from the group consisting of Ir, Pd, Pt, Ni, Au, Rh, Ru, Re, Co, Cu, and their alloys.

19. A structure according to claim 8 wherein said angle flying lead wire is coated with a material selected from the group consisting of Ir, Pd, Pt, Ni, Au, Rh, Ru, Re, Co, Cu, and their alloys.

20. A structure according to claim 8 wherein said sheet comprises materials selected from the group consisting of Invar laminate, a Cu/Invar/Cu laminate, molybdenum laminate.

21. A structure according to claim 8 wherein said sheet comprises a material selected from the group consisting of a metal, a polymer, a semiconductor and dielectric.

22. A structure according to claim 20 wherein said the sheet is overcoated with a polymer layer.

23. A structure according to claim 20 wherein the sheet is overcoated with an insulating layer.

24. A structure according to claim 20 wherein the sheet is overcoated with a thin compliant polymer layer.

25. A structure according to claim 20 wherein the sheet is laminated between two insulating layers.

26. An apparatus for using said structure of claim 8 to test an electronic device comprising:

means for holding said structure of claim 1, means for retractably moving said structure of claim 1 towards and away from said electronic device so that said wire tip ends contact electrical contact locations on said electronic device, and means for applying electrical signals to said elongated electrical conductors.

27. A process according to claim 1 wherein said electronic circuit component is a substrate having an electrical conductor pattern.

28. A method comprising:

providing a substrate surface having a plurality of wire bondable locations;  
wire bonding a wire to each of said wire bondable locations using a wire capillary tool;  
controlling the position of said capillary tool with respect to said substrate;  
after forming a wire bond of said wire to said wire bondable location moving said capillary tool relative to said surface as said capillary tool is moved away from said surface to form a wire having a predetermined shape.